2D Lee Claim Index: User Count Index for Quality & Finer H-Index for Quantity

– Using Examples from Global Top Cryptographers' English Patent Specifications at USPTO

Version (1.0): Research Article in Back-Up/Archive Domain

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***Abstract*—There are many parameters in the prior art to evaluate a researcher's performance in art or science stream for contributed knowledge components. Hirsch index (aka H-index) is a recently popular criterion since its introduction in November 2005. The hereby proposed Lee claim index by Kok-Wah Lee includes (user/ citation) count index and a finer H-index for its interpolation or exploration to see finer ratings between adjacent competitors along their close tracks of running battles. The used principle here is between two peaks deciding the (user) count index and H-index, one can call the rule of thumb that the steeper the negative slope linking the two peaks, the higher, the penalty for citation count index, and the award for H-index, given to approach the index at the lagging peak. Each peak here represents a claim of novel contribution, by taking examples from USPTO patent database and Google Scholar database for data over global top cryptographers' patent claims.**

Due to the risks of human lifetime and interaction, a typical model of Lee claim index has at least two peaks by the same person as a master, and each peak has at least two apprentices as beneficiary for inherited copyrights and secrets. Those minimum four apprentices from the same master form a feasible smallest human network called FCN-4 in the Byzantine Generals Problem (BGP) using oral message type. FCN: Fully Connected Network. Byzantine Agreement Protocol (BAP) can solve the BGP in tolerating the existence of faulty human node(s). Here, Kok-Wah Lee suggests a prior art, being the simplest solution model of PHN based BAP to be used for typical model of Lee claim index. PHN: Pure Human Network. In future, hopefully not only the Lee claim index for the same person can be obtained, but also the pedigree of a significant novel contribution from a master the ancestor to the serially linked apprentices for generations after generations.

Keywords- Quantity & quality; Hirsch index (H-index); citation count; user count; research evaluation; interpolation; extrapolation; global top cryptographer; patent claims; statistical data analysis; pure human network; human risks; Byzantine Generals Problem (BGP); autosophy; resources optimization.

I. INTRODUCTION: WW1 & GAME RULE IN CHESS

Digesting the historians' reports, the World War I (aka WW1, First World War; 28 July 1914 - 11 November 1918) was most probably caused by the breach of a game rule in the mindset, analogous to the *stalemate* situation for *western chess* the board game. Prior to WW1 then, Archduke Franz Ferdinand of Austria, who was the heir to the throne of Austria-Hungary Empire, was assassinated on 28 June 1914 by a Bosnian-Serb student named Gavrilo Princip in Sarajevo, Bosnia [1]. Just like the most wanted game rules in western chess called "check/ checking" and "checkmate". Thus, there comes a game rule in western chess, asking who is now the owner occupying that piece of land. For common sense, a housing unit in a megacity, metropolis, or city is a part of the urban systems, where both the convenience and availability are there.

Since WW1 till today in May 2012, most of the governments, companies, academies, and universities of developed countries in the Europe and America have been investing intensively their resources in the portfolio of research and development (R&D). Those R&D progresses have brought the developed countries from industrial economy to knowledge economy. For instance, in the USA commercial sector, the post-WW1 era has been the first time in history to value the intangible assets higher than the tangible assets.

In the 14th century, a Chinese Taoism prophet called LIU Bo-Wen or LIU Ji (Chinese: 刘伯温；刘基) had written a prediction article called "The Song of a Sesame Seed Cake" (Chinese: 《烧饼歌》) [2]. A sentence there in this article as written by B.W. Liu meaning "to chase away the lions in the North" (北逐狮), has most closely described this situation since WW1. In Chinese language, the Chinese character (狮) (lion) may figuratively mean "lion-like master/teacher".

Till here, one may ask the major causes and major effects. The major causes are the human desires to invent or to own better technologies from *research*, so as to lead ahead other competitors. Meanwhile, the major effects are new technologies invented and penetrating from the military domain, to government domain, to commercial domain, and to civilian domain. And some spreads among the domains.

II. RESEARCH: QUANTITY & QUALITY

Having so many discoveries and inventions, the number of research articles and number of knowledge contributors are also getting abundant until the audience or beholders also may have their senses and perception blurred.

Then in research, there emerge many types of criteria to assess the qualities and quantities of a contributed novel knowledge component, mainly in the form of academic

articles (magazine, conference proceedings, letter, journal/ transactions), university records (technical report, thesis, dissertation, book), company records (book, covert technical report, secret folder, public database), and/or government archives (copyright database, patent database, secret folder).

Talking on the topics of "*quality*" and "*quantity*", normally one can understand the meaning of "quantity" better than the meaning of "quality". Without referring to any dictionary, most of us know that "quantity" is closely related to the amount of some countable objects. However, "quality" is said to be countless, and up to someone to describe. So, let us refer to the dictionaries for the meanings of "quality" as defined by the editors' collected corpus.

From an English-Chinese bilingual Oxford dictionary [3], "quality" (Chinese: 品质；品質；质量；質量) means: (i) (degree, especially high degree, of) goodness or worth; (ii) something that is special in, or that distinguishes, a person or thing; or (iii) (archaic) high social position.

From a pure English Oxford dictionary [4], "quality" means: (i) a degree or level of excellence; (ii) general excellence; or (iii) a characteristic, something that is special in a person or thing. Closely related, "*qualify*" means: (i) to make or become competent, eligible, or legally entitled to do something; (ii) to make (a statement etc.) less general or extreme, to limit its meaning; or (iii) to describe, to attribute some quality to. Thus, when the English words "quality" and "qualify" are checked collectively here, the meaning "to overcome a passing bar (入门栏杆)" is obviously there.

From a pure English Cambridge dictionary [5], "quality" means: (i) [standard] the standard of excellence of something, often a high standard; or (ii) [characteristic] a characteristic or feature of someone or something. Closely related, "*qualify*" means: (i) [standard] to (cause someone to) achieve or have the standard of skill, knowledge or ability that is necessary for doing or being something; or (ii) [right] to (cause someone to) have the legal right to have or do something because of the situation you are in; or (iii) [limit] to limit the strength or meaning of (a statement). Hence, the collective meaning of "quality" and "qualify" can be "to overcome a passing bar" as well.

In other words, the word "quality" can mean "to have fulfilled the minimum demands for an entry level into something, or getting someone's trust or love". The "something" here may mean "a career field" having certain passing marks for an apprentice; or "living standard" for a user or consumer. Meanwhile, "quality" for someone's trust here may mean the qualifiers to form a relationship of cooperation between two individuals; whereas "quality" for someone's love may mean the qualifiers for two individuals to be intimately close. For instance, the IQ (Intelligence Quotient) is a normal distribution $N(\mu = 100, \sigma = 15)$, where μ = mean and σ = standard deviation, that can be used as measuring rulers on the human population to learn and use knowledge in various different subjects or career fields

Coming to here, Kok-Wah Lee the author would like to propose his 2D "*Lee claim index*" for the estimations of the quality and quantity of research outputs from a researcher. The finer H-index of Lee claim index is used to estimate the quantity of useful/valuable research outputs by a researcher above self-average. Meanwhile, the user count index of Lee claim index is used to estimate the quality of useful/valuable research outputs by a researcher. In fact, the criterion of user count can be alternatively interchanged with citation count, user's support votes, customer amount, annual sales, period of popularity, etc. So, a generalized name over the citation count index is "(*user*) *count index*". Then, let us have a quick look at the related works or prior arts.

III. Related Works / Prior Arts

The related works or prior arts chosen here can help a reader of this article to imagine the boundaries of related old knowledge domains, so as to understand the Lee claim index. The chosen essential and functioning items for Lee claim index may be unconditional or conditional for various usages, chargeable, proprietary, alternatives available, or scholastically complimentary. For details, one can trace the originating author(s) or owner(s) for that adopted prior arts.

So far, the citation count and H-index, together with its sample data sources for this statistical data analysis, are essential items for further processing to get Lee claim index. For the principles of Lee claim index, one has to understand the Byzantine Generals Problem (BGP) and its solutions in pure human network of oral message type.

A. *Original Hirsch Index (aka H-Index)*

H-index or full name as Hirsch index was originally proposed by Jorge E. Hirsch the physicist in year 2005 [17]. J.E. Hirsch's *definition* statement on *H-index* is: {

A scientist has index h if h of his or her N_p papers have at least h citations each, and the other (N_p − h) papers have no more than h citations each.

}

In short, H-index is a quantitative measurement of useful research articles by a researcher above self-average. For quantity of one's valuable research articles, other data type is needed. Barring at least one, present H-index shows only an integer value, and does not differentiates among closely tightened competitors. Thus, K.W. Lee the author would like to propose a finer H-index via interpolation or extrapolation.

B. *Variants of H-Index*

Since the proposal of H-index in year 2005, there have been many comments on its plusses and minuses. Besides, many H-index variants [6] have been suggested by many persons. Nevertheless, till today, only the original H-index has been adopted popularly by some well-known databases.

C. *Research: Its Presentation Tools & Evaluation, where Citation Count being the Latest Most Popular One*

H-index is a recently new research evaluation tool claimed to have considered both the quantity and quality of one's research outputs. In fact, today most popular tool is still the citation count over a particular research article [7]. Very high citation count for an article is claimed to have its quantitative citation count to reflect the high quality of this article. But, both H-index and citation count have missed to consider the *risks* of *human lifetime* and *interaction*.

D. Well-Known Useful Cryptographic Functions Solving Some Problems

In the Gaussian distribution (aka normal distribution) of IQ, the intellectuality determines the ability to learn and understand a knowledge component. Depending on the usefulness, this knowledge component can be urgent, important, or imperative to a user. The *functionality degree* decides the *usefulness degree*, and usefulness degree decides the *quality bar*. For example, the *six sigma* (6σ) subject is a management skill for quality control in the present society.

Here, K.W. Lee tested his Lee claim index over patents and academic articles in the cryptography field [12-14]. So, let us have a quick list for well-known useful cryptographic functions solving some problems, as follows: {

(a) secret key cryptography
(b) public key cryptography (PKC): encryption scheme
(c) PKC: signature scheme
(d) PKC: time stamping scheme
(e) one-way hash function
(f) pseudo-random number generation
(g) cryptanalysis
}

E. Patent Specification Format, especially Claim Section

Between patent specification and academic article, the former goes through rigid formal procedures to check the novelty, inventorship, prior art, non-obviousness, inventive step, enablement, usefulness, industrial applicability, unity of invention, patentable subject/class matter, etc. [8]. However, *unethical hackers* existing in the Internet era are great threats to the inventorship. For academic article, an academy or a commercial publisher will be in charge, but it has less formal and lower passing bar, where the authorship is always in questions [7]. Thus, *patent claim* is selected for usages.

For present *authorship* of an academic article, an author may be due to novel idea conception, reduction to practice, comment, advisory, nominal supervision, source of sample, funding, equipment supply, etc. However, for *inventorship* of a patent, it has to be the legally correct natural person(s) contributing the novel idea conception; and hence most *namby-pamby* persons not specializing into a career field will have been filtered out first.

F. Byzantine Generals Problem (BGP)

Till here, one knows that the number of human heads in a patent as inventor is a small integer normally. Then, K.W. Lee adds an extra item for consideration, i.e. the *risk of human interaction*. This risk is mainly due to BGP [18], and there exist many solutions called BAP (Byzantine agreement protocol) [19, 9-10]. In Chinese language, BGP is named as a proverb, i.e. "cheating the sky to have traveled across the sea", and ranked as the first strategy in a book called "Thirty Six Tactics" (《三十六计 • 第一计之瞒天过海》).

G. Pure Human Network based Byzantine Agreement Protocol (PHN based BAP): A Horizontally Parallel Base Partner to ANN based BAP

So, a human group of few inventors forms a pure human network. For most of the cases, a patent may have only an inventor present, but mostly at least two independent patent claims. For sure, due to the *risk of human lifetime*, the sole inventor can become a master to have apprentices. Question here now is how many persons can have inherited the other parts being the secrets known only by the master. For intangible asset, it is common that it is a group of secrets, copyrights, patents, industrial designs, etc.

To handle the risks of human lifetime and interaction, there shall be at least two and four persons, respectively. It needs two master water taps/faucets to safely control the main water supply to a housing unit. For *BGP of oral message type*, at least four persons are needed to get a common agreement. Here, *ANN based BAP* [9-10] originally designed by K.W. Lee for computer memory space, can be modified and suited into the human network. ANN: Artificial Neural Network. In case *computer cryptography* or *bitstream cryptography* is not used in secret communications, then one may alternatively use *computer-free cryptography using Chinese language seed* [11], to support the PHN based BAP.

PHN based BAP, alike the *structure of a simple organic carbon compound*, is invented by K.W. Lee in view of every one's most core human network consists of very few persons and rare to see at about 10. For *risk of human lifetime*, there shall be at least two apprentices for a group of invention. For *risk of human interaction* or BGP, there shall be at least two groups of invention having minimum four apprentices in total. In Chinese, it is known as (寥寥无几；寥寥可数). A group of invention is well to be a publicly known copyright and a restricted secret. In English, it is called "words for mouths", "words for a layperson/ layman/ laywoman". In Chinese, there is a story in character (師字；师字).

IV. Lee Claim Index: Conditions, Theory, Equations, Sample Data & Calculations

From Part III.G, K.W. Lee lists the *essential conditions* for the establishment of Lee claim index, as follows: {

(a) To assess a contributor on one's quantity and quality.
(b) Excellent functional tool has a pedigree of learners.
(c) To avoid absolute power bringing absolute corruption
(d) An invention group shall have many parts, at least a main publicly known copyright and a restricted secret.
(e) To tolerate the risk of human lifetime by having at least two apprentices per invention group.
(f) A master shall have at least two invention groups to balance the forces.
(g) To tolerate the risk of human interaction or BGP, a master shall have at least four apprentices.
(h) For time efficiency of BAP or to get a consensus, the formed human network shall be of small size.
(i) To have quality data, the concepts of inventorship and patent claim in the patent system shall be used.
(j) Optimization concept on human brain, time, & space.
}

Bar one from this conditions group, the smallest master-apprentice network is two persons, used for superb control away from secret leakage. In Chinese, there is a story in character (坐字；坐天下), meaning two persons on a land.

The current *Lee claim index* consists of two parts. A *first part* is the familiar H-index curve getting a finer H-index value at the interpolated or extrapolated point, on the straight line between two peaks intersecting the straight line y = x. This finer H-index x_h is to tell the quantity of useful/valuable knowledge components by a contributor above self-average.

From Part III.D, the users' statistical data, like *citation count*, is selected for testing over the Lee claim index to see the *usefulness degree*; and usefulness can tell the *quality*.

A *second part* is a researcher has to focus to contribute at least two units of quality output. Using the similar H-index curve for testing, the first two topmost peaks, A(x_A, y_A) and B(x_B, y_B), are opted for evaluation of research quality.

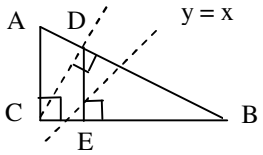

Figure 1. Diagram showing two peaks A & B to get formulae for x_h & y_D.

In Fig. 1, points A, B and C(x_A, y_B) form a right triangle. The (*user*) *count index*, like citation count, is at point D(x_D, y_D), where line AB crosses a line from point C perpendicular to line AB. The used principle here is between two peaks deciding the count index, one can call the rule of thumb that the steeper the negative slope linking the two peaks, the higher the penalty for count index, given to approach the index at the lagging peak B. The y-axis value of point D is the count index showing the quality of one's useful/valuable knowledge components. In Chinese, character (量字; 旦里也) has a story, meaning a sunrise/initial mile.

Combining the finer H-index the first part for quantity and count index the second part for quality, then function (1) can have Lee claim index in *2D* (two dimensional) *form*.

$z = f(x = \text{finer H-index } x_h, y = \text{count index } y_D) = 0$ (1)

A second graph z for a group of researchers in the same career field, or for comparisons among career fields, can be plotted to see deeper, when the data are available.

Yet to add the *optimization concept* on human brain, action time, and memory space, as similar to the *autosophy* (i.e. self-learning) *theory* invented by K.E. Holtz [15] working on computer memory space, K.W. Lee can claim that for an excellent researcher having a few subject groups, one's subject groups can be put under a mother title, as like diamond into carbon. One's topmost two peaks forming a count index can be a dominant group overseeing, controlling or influencing all the other lagging tails. In Chinese, there are stories for character (总字; 總字) meaning total, and phrases (总题) meaning mother title, and (总部分行一条龙) meaning *headquarter* and branches forming a dragon. From Taoism, there are five basic elements (金水木火土), hinting a *dragon* may consist of at least five components or peaks. In Chinese, a field (田) has four mouths (口) and one eye (眼).

A. *Case 1: Peak-like H-Index as Exact Value*

For this case, finer H-index = H-index as exact value.

B. *Case 2: Finer H-Index between Two Equal-Level Peaks*

For this case, finer H-index = magnitude of (user) count for the two equal-level peaks. The user count here can be citation count for positively close relationship to usefulness.

C. *Case 3: Finer H-Index between Two Unequal-Level Slanted Peaks*

For this case, finer H-index (x_h) is termed in Eqs. (2-3).

$$\tan \alpha = BC / AC = 1 / (y_A - y_B), \quad \text{where } 0 \le \alpha \le \pi/2 \tag{2}$$

$$x_h = (x_B * \cot \alpha + y_B) / (1 + \cot \alpha) \tag{3}$$

D. *Case 4: Extrapolated H-Index between a Peak and an Added Zero Ground Point Tracking behind*

For this case, finer H-index (x_h) is termed in Eqs. (4-5).

$$x_B = x_A + 1, \; y_B = 0. \tag{4}$$

$$x_h = ((x_A + 1) * y_A) / (1 + y_A) \tag{5}$$

E. *Case 5: Included Person without Any Article or Claim*

For this case, simply set the finer H-index = 0.

F. *Case for Golden Interpolated (User) Count Index*

On quality, count index (y_D) is termed in Eqs. (2, 6).

$$y_D = y_A - (y_A - y_B) * \cos^2 \alpha \tag{6}$$

G. *Examples of Finer H-Index on Top Cryptographers*

Taking two global topmost cryptographers as example, their finer H-indices of Lee claim index for useful quantity of patent claims (PC) [12-14] are as follows:

$$x_h \text{ (Adi Shamir)(PC)} = 17.38 \tag{7.1}$$

$$x_h \text{ (Ronald Rivest)(PC)} = 12.33 \tag{7.2}$$

H. *Examples of Count Index on Top Cryptographers*

Taking two global topmost cryptographers as example, their citation count indices of Lee claim index for useful quality of patent claims (PC) [12-14], or copyrighted research articles (CRA) [16] are as follows:

$$y_D \text{ (Adi Shamir)(PC)} = 27.20 \tag{8.1}$$

$$y_D \text{ (Ronald Rivest)(PC)} = 27.20 \tag{8.2}$$

$$y_D \text{ (Adi Shamir)(CRA)} = 6513.000196 \tag{9.1}$$

$$y_D \text{ (Ronald Rivest)(CRA)} = 4061.000133 \tag{9.2}$$

$$y_D \text{ (Me myself)(CRA)} = 4.000 \tag{9.3}$$

V. Selected Internet Sources of Sample Data

For the selected Internet sources of sample data, the following considerations have been given: {

(a) Name list of well-known useful cryptographic tools.

(b) Name list of global top cryptographers according to website <www.cryptographersworld.com> [12].

(c) From defined problems or/to useful functions to useful tools to famous natural contributors, then what criterion to be selected for comparisons.

(d) Claims of patent files in the USPTO database [13].

}

VI. Discussions on Plusses of Lee Claim Index

J.E. Hirsch presented his H-index to quantify one's scientific research outputs [17]. Meanwhile, the presented Lee claim index here is a 2D index, where its x-component is

finer H-index to show the research quantity, and y-component is (user) count index to show the research quality.

VII. Discussions on Minuses of Lee Claim Index

Theory for Lee claim index has been presented here, but only citation count data is available to K.W. Lee. For other (user) counts like user amount, votes, and popularity period, statisticians are needed to collect the data, so as to estimate more accurately the usefulness degree or valuable degree.

VIII. Conclusions & Suggestions

The methods proposed by K.W. Lee here are to help estimate the quantity and quality of one's useful or valuable research outputs. From him, human risks must be considered.

In future, me Lee hope that historical data for pedigree of a significant novel contribution from a master the ancestor to apprentices in serial generations can also be obtained.

IX. What I / ~~We~~ Claim Here ~~IS~~ / ARE :

[Format] Whose: What contribution(s) (ART: character / role / style / fashion; SCIENCE: discovery / innovation / invention; ART & SCIENCE: design / model / architecture; others).

- wherein a novel knowledge contribution component for useful art and science is under a type of claimable class matters (process / machine / manufacture / composition of matter / improvement thereof from the previous subject class / natural plant).

[Claim 1] K.W. Lee: A derived method from Hirsch index to interpolate or extrapolate to get finer H-index between two peaks, so as to show quantity of one's useful or valuable research outputs, among close competitors.

[Claim 2] K.W. Lee: A new method after considering the risks of human lifetime and interaction to estimate the (user) count index from the first two topmost peaks, so as to show quality of one's useful or valuable research outputs.

[Claim 3] K.W. Lee: A new method combining the finer H-index (x) in Claim 1 and (user) count index (y) in Claim 2 to form Lee claim index in 2D form.

[Claim 4] K.W. Lee: A derived method from Claim 3 so as to get data from many researchers in various fields to plot a 2D graph for comparisons within or among career field(s).

[Claim 5] K.W. Lee: A new method to figure out the resources optimization of human brain, time, and space, so as to form a dominant subject group as a headquarter (HQ) from topmost peaks to lead other lagging peaks or groups.

[Claim 6] K.W. Lee: An enablement model as a simplest case for Claim 5 to acclaim a dragon-like group has 5 peaks.

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For World War III, Baba Vanga the Bulgarian prophetess predicted that it would be from Nov. 2010 to Oct. 2014.

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